December 3, 2007

To: Chair Rebekah Warren
Members of the Michigan House of Representatives, Committee on Great Lakes and Environment

Re: **HB 4343, 5065-5073**

Dear Chairperson Warren:

Thank you again for allowing Absopure and its corporate partners to present testimony on November 28th regarding the above-referenced water use legislation. Sound management of Michigan's water resources is vitally important to our companies' ongoing commercial success, but it's equally important to our owners and the more than 1,000 employees who reside in this state as Michigan citizens who enjoy our wonderful Great Lakes heritage.

Absopure remains committed to working with reasonable and responsible stakeholders to fashion sensible water management policies, as we did in supporting passage of Public Acts 33-37 of 2006. Conversely, we oppose proposals that would endanger Absopure's ability to continue business operations in this state, which many of the provisions of HB 5065-5073 would do.

We promised to do three things to follow up our testimony: (1) provide copies of the updated PowerPoint demonstration; (2) provide back-up data regarding the 14:1 import/export ratio for bottled water in the Great Lakes basin, and (3) provide a detailed summary of our comments on HB 5065-5073.

Attached, please find 30 copies of:

1) The updated PowerPoint demonstration.
2) Section 3 of the final report of the International Joint Commission, entitled "Protection of the Waters if the Great Lakes," submitted to the *Governments of Canada and the United States* in response to a February 10, 1999, referral from the governments to undertake a study of such protection.
3) The study entitled "Bottled Water Production in the United States: How Much Groundwater is Actually Being Used," conducted by Keith N. Eshleman, PhD. from the University of Maryland Center for Environmental Science

The following are detailed comments on the bills dealing specifically with Bottled Water and Water Withdrawals.

HB 5065

- ◊ HB 5065 eliminates the sections of NREPA that define bottled water as a "consumptive use", and which specifically exclude it from the definition of "diversion". This fundamentally re-characterizes (and, in doing so, mischaracterizes) the nature of our business operations, by legislatively defining our primary business as a "diversion " of Great Lakes water rather than the sale of a consumptive use consumer food product. This is contrary to logic and commonsense, and subjects bottled water to regulation as written that is uniquely burdensome on this food product over any other (based on regulations set forth in other portions of these tie-barred bills).
- ◊ HB 5065 and the tie-barred legislative package is a recipe for regulatory paralysis. The package imposes numerous regulatory requirements without adequate funding (it simply states that additional resources will be required), imperiling the ability of the regulated entities to conduct legitimate business operations.

HB 5066

- ◊ HB 5066 adds uncertainty due to the possibility of regulatory activism. Industry sectors are obliged to submit proposed sector-specific water use conservation guidelines in an unrealistically short timeframe, and the DEQ is given authority with undefined criteria to approve or disapprove these proposed guidelines.
- ◊ HB 5066 adds additional uncertainty (and possibility of unfair regulatory requirements) in its requirement for water users to remediate "hydrologic impacts", which is undefined and susceptible to multiple interpretations (many of which would not be linked to objective criteria).

HB 5067

- ◊ HB 5067 improperly expands the common law doctrine of public trust to groundwater, adding great uncertainty by leaving us open to challenge by anyone willing to file a lawsuit even if they have no material or actual property rights affected by our business operations. Bringing county prosecutors into the equation adds additional uncertainty into the process, creating the possibility of 83 different regulatory regimes.
- ◊ Raising the maximum fine from $1,000 to $10,000 would be acceptable if the regulations were objective and well-defined; however, the enormous regulatory uncertainty brought about by many of the other changes makes this problematic. The legislative package as whole injects too much uncertainty into the overall process.

HB 5068

- ◊ HB 5068 moves the goal lines on capital investments **already deployed by businesses** in the state, such as Absopure by setting the baseline at historical use rather than permitted capacity. This also restricts a business's ability to nimbly react to competitive market changes within its respective sectors, by requiring them to undergo approvals through the burdensome regulatory processes imposed by other portions of the overall legislative package.
- ◊ HB 5068 significantly rewrites the permitting process in a way that increases the regulatory burden and by exponentially increasing uncertainty:
  - ◊ Absopure is generally supportive of the water use assessment tool that is under development. It is based on peer-reviewed, objective science. This bill improperly expands the category of review to two additional scenarios, "stream reach flow reduction" and "sensitive water resource areas". These phrases are undefined and not linked to objective, scientific criteria, and thus open private property rights to untrammeled confiscatory taking. It also injects a number of improper or undefined criteria by which the DEQ is directed to make its decisions.
  - ◊ The new permit requirements impose unreasonable, expensive requirements to conduct hydro geologic studies and information. This may be appropriate if the peer-reviewed scientific assessment tool indicated the possibility of an adverse resource impact, but not in other instances.
  - ◊ Permits only last 5 years, injecting additional uncertainty to capital investment decisions.
- ◊ Absopure supports public comment. The current law allows for a sensible mechanism for challenges by persons actually harmed by permit decisions. HB 5068 improperly opens up the initial permitting process to those who do not have reasonable or material interest in the outcome, which will unduly delay and impede legitimate business operations. It also **improperly** opens up the challenge process in a similar fashion.

HB 5069

- ◊ Assuming adequate resources and time for completion of its development, Absopure supports deployment and use as quickly as possible of the water use assessment tool (peer-reviewed, science-based).

HB 5070

- ◊ "Water user" committees should be limited to actual water **users**. It may be appropriate to allow local participation in long-range water planning by means of creating different groups.
- ◊ Allowing local units of government to enact water use ordinances exponentially increases regulatory uncertainty by opening businesses up to a patchwork quilt of varying rules and requirements.

HB 5071

- ◊ Other than our issues with HB 5068, which this bill incorporates into Section 4 of the Safe Drinking Water Act, Absopure has no additional comments.

HB 5072

- ◊ A separate annual report to the Department of Agriculture as defined unfairly singles out the bottled water industry, no other industry or user is required to do anything like this.
- ◊ Lowers threshold trigger from 250K GPD to 100K GPD.
- ◊ Incorporates HB 5068 into Section 17 of the SDWA, other than our issues with HB 5068 Absopure has no additional comments on this portion of the bill.
- ◊ Requires a public hearing before decision, unfairly singles out bottled water nobody else has this requirement.
- ◊ Opens up complete application to FOIA requests from the public, again unfairly singles out bottled water. Also a safety risk, since this is a food product.
- ◊ Permits full de novo judicial review, gives no deference to agency expertise.
- ◊ No other food product has to meet these requirements. Many of which have greater sales and thus use a great deal more water.

HB 5073

- ◊ HB 5073 regulatory burden and uncertainty. It cedes legislative authority to the DEQ to define undefined terms and/or impose new requirements not contained in this package of bills.

If you or any of the members of the Committee have further questions, please feel free to contact me at (734) 354-7282, or our lobbyist Alan Canady at (517) 318-3023.

Sincerely,

Robert J. O'Donnell
Corporate Counsel

diversions and other artificial means. Water is also diverted around Niagara Falls for hydroelectric power generation, and water is diverted from Lake Erie to Lake Ontario through the Welland Canal.

Groundwater is important to the Great Lakes ecosystem because it provides a reservoir for storing water and for slowly replenishing the Great Lakes through base flow in the tributaries and through direct inflow to the lakes. Groundwater also serves as a source of water for many human communities and provides moisture and sustenance to plants and other biota.

The Great Lakes Basin is home to a diverse range of fish, mammals, birds, and other biota. The interplay between human activity and the natural order of the Lakes is complex and only partially understood. Human activity is altering the biological diversity and the socioeconomic structure of the Great Lakes Basin. Not only has there been some loss of species in the Lakes, but there has also been the introduction and establishment of alien invasive species like the lamprey eel, the zebra mussel, and the goby fish through channels built to foster transportation and electricity. Urbanization and farming have changed the hydrology of the Lakes by reducing wetlands and other natural habitats and by altering the speed at which runoff reaches the lakes[4].

Section 3 - Water Uses in the Great Lakes Basin

The Commission has conducted an examination of water use data in the Great Lakes Basin. Water uses are presented in two categories: (1) consumptive uses estimated from water withdrawal data and (2) removals. Close to 90 percent of withdrawals are taken from the lakes themselves, with the remaining 10 percent coming from tributary streams and groundwater sources (Figure 2-A)[5].

In its Interim Report issued in August 1999, the Commission used the most current data that were available at that time for its analysis—1993 data drawn from the Regional Water Use Data Base, maintained by the Great Lakes Commission (GLC) on behalf of the Great Lakes states and provinces[6]. These data did not include consumptive use figures for the Chicago urban area.

Since the Interim Report, the GLC has provided the Commission with more recent water use data[7]. Although most of these data are concentrated in the years 1994-98, not all of the data fall into this time frame[8]. Because the data span several years and the methods of data collection vary from one jurisdiction to another, trend analysis and jurisdictional comparison are difficult. In some instances, there are large differences between the two sets of data in water use by sector presented by some individual jurisdictions; the reasons for these differences are not always clear. The Commission is of the view that analysis of the 1994-98 water use data by sector and jurisdiction is of limited value. It decided to focus instead on the overall aggregate Basin figures for withdrawals and consumptive use, and compared these figures with the equivalent 1993 numbers, including Chicago consumption data.

The Commission also looked at Great Lakes Basin water use data, extracted from national databases compiled by the U.S. Geological Survey (USGS)[9] and Environment Canada (EC)[10]. For its five-year reports, the USGS analyzes state data, adjusts the data to compensate for perceived deficiencies, and produces estimates of actual water use for the year of the report. Environment Canada derives its information from Statistics Canada surveys of major water users in the Basin, not from provincial data. Environment Canada's water use data tend to be lower than data provided by the provinces to the GLC's Regional Water Use Data Base, since provincial data are generated from water license permits as opposed to actual withdrawals. Like the USGS, Environment Canada's treatment of data is viewed as consistent over the years. As with the 1994-98 GLC data, the Commission concentrated on Basin aggregate numbers for withdrawals and consumptive use, mainly because of the somewhat different water use sector category and classification systems utilized by the two federal agencies.

Table 1 provides data (rounded) for withdrawals and consumptive use calculated from the various databases above. All tables and charts in this final report now reflect data for the Chicago urban area. The data indicate a range for water use in the Great Lakes Basin. The percentage of water consumed is approximately the same for all data sources, ranging from 4.4 percent to 4.6 percent.

Consumptive Use

For consumptive use, the Commission determined that the 1993 data, now updated with the inclusion of full water use data for Chicago, would be the basis for its final report. The Great Lakes Commission stated that the 1993 data were sufficiently comprehensive and consistent across all jurisdictions, were the product of a quality assurance and control process by its committee of water resource managers, and provided the best possible snapshot of water use in the Basin.

In 1993, consumptive use in the Great Lakes Basin was estimated to be 121 cms (4,270 cfs) as compared to a withdrawal of about 2,493 cms (88,060 cfs) (Figure 2-B). The 1993 consumptive use in the Great Lakes Basin can be summarized as follows:

- By country: Canada, 33 percent, and the United States, 67 percent, with per capita consumptive use being approximately equal for the two countries.
- By jurisdiction: Ontario, 27 percent; Michigan, 21 percent; Wisconsin, 20 percent; Indiana, 7 percent; New York, Quebec, and Ohio, 6 percent each; Illinois, 4 percent; Minnesota, 2 percent; and Pennsylvania, less than 1 percent (Figure 2-C).
- By type of water use: irrigation, 29 percent; public water supply, 28 percent; industrial use, 24 percent; fossil fuel thermoelectric and nuclear uses, 6 percent each; self-supplied domestic use 4 percent; and livestock watering, 3 percent (Figure 2-D).

The percentage of withdrawn water that is consumed within the Great Lakes system varies with the type of use to which the water is put. When water is used for irrigation, over 70 percent is consumed[11]. At the other extreme, when water is used for thermoelectric power, less than 1 percent is consumed. The percentage of water lost to the Basin when it is used for public supply and for industrial purposes—other large water-using categories—is of the order of 10 percent for each (Figure 3). As previously indicated the average consumption rate, considering all types of uses, is approximately 5 percent.

Consumptive use data for groundwater are not available for most jurisdictions. Groundwater withdrawal in the Great Lakes Basin is estimated to be generally between 3 percent and 5 percent of the total water withdrawal in the Basin. This figure, however, greatly understates the importance of groundwater to the Basin population. The USGS estimates that over 8 million people on the U.S. side of the border rely on groundwater as their source of drinking water, and groundwater is the most common source of bottled water. The effects of groundwater withdrawal may therefore be of concern on a local or subregional basis, particularly with respect to urban sprawl, even if withdrawals do not have a major impact on the overall water budget of the Basin[12].

The Commission has developed insights into trends in water use and their impact on potential future water demands. These insights were derived from a simple extension of trends established over the previous decade. The variability in existing data complicates not only analysis of past and present trends, but also the task of predicting the future. All predictions are heavily dependent on the assumptions underlying them and on an accurate understanding of the present starting point. Factors such as climate change could encourage the increased use of water for irrigation and other purposes. On the other hand, continued improvement in water demand management as well as in water conservation might help to slow any increase in withdrawals for consumptive use within the Basin. Because population will increase, there is a greater probability of increasing use in the future than there is of decreasing use. Projections presented below extend to 2020. The Commission believes that water use is likely to increase modestly by 2020 and that projections beyond this point should be considered highly speculative.

Thermoelectric Power Use. At thermoelectric power plants, water is used principally for condenser and reactor cooling. In the United States, thermoelectric withdrawals have remained relatively constant since 1985 and are expected to remain near their current levels for the next few decades. In Canada, modest increases are expected to continue along with population and economic growth.

Industrial and Commercial Use. In the United States, industrial and commercial water use has declined in response to environmental pollution legislation, technological advances, and a change in the industrial mix from heavy metal production to more service-oriented sectors. A similar trend is evident in Ontario, so combined use is expected to gradually decline through 2020.

Domestic and Public Use. In the United States, water use for domestic and public purposes in the Great Lakes Basin generally increased from 1960 to 1995 and is expected to climb gradually through 2020. In Ontario, however, the modest downward trend established in recent years because of water conservation efforts is expected to continue.

Agriculture. In the United States, water use for agriculture in the Great Lakes region increased fairly steadily from 1960 to 1995 and is expected to continue to grow. In Canada, the rate of increase was somewhat greater, so that combined projections indicate a significant increase by 2020. Climate change could increase even further the competitive advantage in agriculture the Basin has as a result of its relative abundance of water.

Total Water Use. There is agreement that water withdrawal will increase in the future, although it is impossible to say with confidence just how much the increase will be[13]. There is, however, no such agreement on consumptive use. For example:

- The USGS and the U.S. Forest Service both estimate that water withdrawals in the U.S. portion of the Great Lakes Basin could rise about 2 percent from1995 to 2040.
- The USGS forecasts a decline of 2 percent to 3 percent in consumptive use of water in the U.S. section of the Great Lakes by 2020.
- A consultant to the study team developed a trend line for the period 1995-2020 that has consumption rising by 27 percent in the U.S. portion of the Basin, by 19 percent in the Canadian portion of the Basin, and by 25 percent in the whole Basin.
- The same consultant also produced estimates for a "conservation" scenario that projected rises in consumption by 2020 in the U.S. portion of the Basin of 4 percent, in the Canadian section of 1 percent, and in the total Basin of 3 percent.

The above figures may represent a range of possibilities. What is clear is that water managers will need to manage the resource carefully.

Removals

Removals are waters that are conveyed outside their basin of origin by any means. The following paragraphs discuss current removals by diversion, other types of removals such as removal by marine tanker, bottled water, or ballast water, and the potential for future diversions and other removals. Some past diversion and removal proposals are summarized in Appendix 6.

Current Diversions. Water diversions into and out of the Great Lakes Basin are summarized in Figure 4 and by the accompanying data in Table 2.

The U.S. Supreme Court has authorized an average removal of 3,200 cfs (91cms) from Lake Michigan into the Mississippi River system through the Chicago Diversion. This is the only major diversion out of the Great Lakes Basin. From 1981 to 1995, the Chicago Diversion, as reported by the Corps of Engineers, has averaged 3,439 cfs (97 cms), which is 239 cfs (6.9 cms) more than the U.S. Supreme Court limit of 3,200 cfs (91 cms). Pursuant to the 1996 Memorandum of Understanding, the state of Illinois has agreed to repay the cumulative flow deficit by the year 2019.

The Long Lac and Ogoki diversions into Lake Superior from the Albany River system in northern Ontario are the only major diversions into the Basin. These two diversions represent 6 percent of the supply to Lake Superior.

At present, more water is diverted into the Great Lakes Basin through the Long Lac and Ogoki diversions than is diverted out of the Basin at Chicago and by several small diversions in the United States. If the Long Lac and Ogoki diversions were not in place, water levels would be 6 cm (2.4 in.) lower in Lake Superior, 11 cm (4.3 in.) lower in Lakes Michigan–Huron, 8 cm (3.1 in.) lower in Lake Erie, and 7 cm (2.8 in.) lower in Lake Ontario[14].

Aside from these major diversions, there are also a few small diversions[15]. Three were implemented in the 19th century to facilitate waterborne commerce between the Great Lakes and neighboring drainage basins. These are the Forestport, New York, diversion of water from the Black River tributary of Lake Ontario into the Erie Canal and Hudson River basin; the Portage Canal diverting Wisconsin River water from the Mississippi River system into the Lake Michigan basin; and the Ohio and Erie Canal diverting water from the Ohio River basin into the uyahoga River of the Lake Erie basin. All three are now used primarily for recreational purposes.

In recent years, London, Ontario and Detroit, Michigan have taken water from Lake Huron for municipal purposes, discharging their effluent to Lake St. Clair and the Detroit River, respectively. The Raisin River Conservation Authority in Ontario has, with the approval of the Commission, taken water from the international section of the St. Lawrence River to maintain summer flows in the Raisin River. Ohio has reported very small diversions in Lorain County and the City of Ravenna, both communities whose customers straddle the Lake Erie–Ohio basin divide. The information in this section covers the diversions of which the Commission is aware. There may be others.

Two U.S. communities —Pleasant Prairie, Wisconsin, which lies outside the Basin, and Akron, Ohio, whose water district straddles the Great Lakes Basin divide— have obtained permission under U.S. law (the Water Resources Development Act of 1986) to take water from the Great Lakes on the condition that they return an equivalent volume of water over time to the Basin. In 1988, the Great Lakes governors approved the Pleasant Prairie Diversion and agreed that a like amount of water would be returned to the Lake Michigan Basin by 2005. Although this diversion was below the consultation trigger amount in the Great Lakes Charter, Ontario and Quebec were consulted. Quebec concurred, but Ontario did not. The diversion was implemented. After 2005, the diversion would provide "no net loss" to Lake Michigan. With respect to Akron, the governors approved; Ontario concurred, and Quebec did not object. The state of Ohio has already increased the flow of water into the Cuyahoga River from the Ohio/Portage system to support the Akron Diversion, and there is no loss of water to the Great Lakes from this diversion.

In addition to these diversions in and out of the Great Lakes Basin, the Welland and Erie Canals divert water between subbasins of the Great Lakes and are considered intrabasin diversions[17]. In 1997, another small intrabasin diversion was built from Hamilton to the Haldimand region in Ontario.

Other Removals. Public concern has been focused on the potential movement of freshwater in bulk beyond the Great Lakes Basin by ocean tankers. To date, no contracts re in place, and no regular trade has begun to ship water in bulk from the Great Lakes Basin or from North America as a whole[18]. For almost two decades, however, entrepreneurs have actively pursued foreign markets and have sought approval to export from jurisdictions on both the west and east coasts. When the Interim Report was written, Alaska, Newfoundland, and Quebec were considering proposals to export freshwater in bulk by ocean tankers, although both Newfoundland and Quebec have since moved to prohibit such exports subject to exceptions described in Section 8 of this report.

The Commission has learned that one exporter in Alaska was shipping a small volume of water, 378,500 liters per week (100,000 gallons/week). The Commission understands that orders for Alaskan water have fallen significantly since the beginning of 1999. The water is placed in containers that are barged to Washington state, where the water is bottled. It is then shipped to Alaska, Taiwan, and Korea. Although it seems clear that climate change and continued reports of worldwide water shortages will continue to keep discussion of bulk water shipments alive, the cost of such shipments makes it unlikely that there will be serious efforts to take Great Lakes water to foreign markets, and cost will continue to serve as an impediment to bulk shipments from coastal waters. Thus far, companies in these jurisdictions have captured only small markets for bottled water.

Analysis of the bottled water industry indicates that when intrabasin trade in bottled water is subtracted from the total trade, the Basin imports about 14 times more bottled water than it exports— 141 million liters (37 million gallons) in 1998 imported vs. 10 million liters (2.6 million gallons) exported. At this time, bottled water appears to have no effect on water levels in the Great Lakes Basin as a whole, although there could be local effects in and around the withdrawal sites[19].

Trade in other types of beverages is believed to be of a similar order of magnitude[20]. For example, 272 million liters (72 million gallons) of bottled water were exported in 1998 from all of Canada to the United States. That represented 33 percent of all beverage exports from Canada to the United States that year, compared with 44 percent for beer and 19 percent for soft drinks. Considering the extremely small magnitude of trade in bottled water and other beverages, it would appear both impractical and unnecessary to treat bottled water and other beverages any differently than any other products that either include water or use water in their production processes.

In July 1999, there was a flurry of media interest in the bottled water situation in Ontario. According to media reports, the Ontario government had issued permits authorizing the withdrawal of 18 billion liters (4.8 billion gallons) of water per year for bottling purposes, almost all from groundwater sources. Only about 4 percent of this volume is currently being withdrawn, amounting to a flow of 0.02 cms (0.7 cfs), and Ontario is reviewing whether groundwater supplies are adequate to satisfy the licenses that it has issued to bottling companies. It appears that most of this water remains within the Great Lakes Basin. While the Commission is sensitive to the potential importance of this matter to local groundwater regimes, at this time the Commission believes that this is not a significant issue with respect to the level of Great Lakes waters and that local effects can be managed best at the local level.

Ballast water, which is used to stabilize vessels, has always been considered a noncommercial item. No evidence has been found to suggest that any ballast water taken from the Great Lakes Basin is sold abroad. It should be noted that water quality is not an issue for the purpose of establishing ballast, but discharging ballast water can lead to the introduction of alien invasive species. A number of these species are now prevalent throughout the Great Lakes Basin. Over a recent nine-year period, the net loss of water from the Great Lakes Basin as a result of ships taking on ballast water in the lakes was equivalent to an average annual flow of 0.02 cms (0.7 cfs)[21].

Potential for Future Diversions and Removals. Many speakers at the public hearings on the Interim Report said the Commission too readily dismissed the threat of major diversions from the Great Lakes to other regions, especially the Southwestern states. They indicated that while an analysis of past proposals for mega-diversions indicates that they may not have been feasible, at least from an economic standpoint, this does not mean that proposals of this kind could never be pursued for economic or other reasons. While the Commission acknowledges the anxiety expressed by some at the hearings, the Commission continues to believe that the era of major diversions and water transfers in the United States and Canada has ended. Barring significant climate change, an overcoming of engineering problems and of numerous economic and social issues, and an abandonment of national environmental ethics, the call for such diversions and transfers will not return. At present, there do not appear to be any active proposals for major diversion projects either into or out of the Basin. There is little reason to believe that such projects will become economically, environmentally, and socially feasible in the foreseeable future.

In the United States, the era of major diversions and water transfers was linked to the transcontinental movement of population and industry, which fostered a dynamic of resource exploitation to support new settlements and new economic activity. In the western United States, engineers created, at tremendous cost, networks of dams, reservoirs, and canals to harvest water sources to support power generation, irrigation, human consumption, and sanitation. As the west moves into the 21st century, concerns are turning to ecosystem restoration and environmental remediation, and sustainable management has begun to guide regional planning principles.

The mega-projects that have already been completed targeted the most easily accessible areas. Future mega-diversions would present many additional engineering challenges. Although most of these challenges could be overcome, the costs of such projects, whether by pipeline or channel, remain enormous. Not only must capital be invested in the construction of the project, but also operating and maintenance funds must be found to support the effort. Every study of such projects has highlighted the high energy costs associated with the pumping of water over topographic barriers. Mega-diversions also require rights-of-way for their passage and security for the products being transported, which would be difficult to obtain. The environmental costs of such projects in terms of disruption of habitat and species movement are enormous. A project similar to the current California Aqueduct would represent 75 percent of the current consumptive use in the Great Lakes Basin and would, prima facie, have a major environmental impact on aquatic and terrestrial resources. Increasingly, water managers recognize the validity of pricing water at its true value, making it far more cost effective to increase the available supply of water by using existing supplies more efficiently as they are allocated among basin interests.

The 1998 Report of the Western Water Policy Review Advisory Commission[22] confirmed earlier expert analysis that Western states have options for water that are less expensive and less open to legal challenge than long-distance import of water from the Columbia, Missouri–Mississippi, or Great Lakes basins. The population of the Western states is continuing to grow faster than the national average. It is an urban population and may be able to afford to buy and lease existing water rights from the less-productive agricultural sector. Water savings are already being realized by some cities in the Southwest as a result of conservation measures and improved irrigation practices. The fact that agriculture still accounts for almost 80 percent of water withdrawals in Western states, most of it for low-value crops like alfalfa and corn, indicates that there will continue to be significant opportunities for reallocation of existing supplies for the foreseeable future.

Even if mega-diversions were technically and economically feasible, current water management thinking recognizes that the political difficulties of managing water effectively increase as one moves beyond a single basin. Although it can be very difficult to do so effectively, those who share a basin generally recognize the importance of working together to manage both excess and shortfall, as well as water quality. Agreeing to cooperate across both political boundaries and basin divides is even more difficult, and it would be impossible for Great Lakes jurisdictions to guarantee an uninterruptible supply to a non-Basin consumer of water. Some interests in the Great Lakes Basin, such as riparian homeowners, might welcome a means of removing water from the Basin during periods of extremely high levels. Most interests, including in-stream interests, commercial navigation, and recreational boating, would be adamantly opposed to such removals in periods of low levels. Diversions during droughts would, however, be difficult to interrupt because of the dependency that diversions create among recipients. The Commission recognizes that once a diversion to a water-poor area is permitted, it would be very difficult to shut it off at some time in the future.

The Chicago Diversion, where infrastructure already exists, is a possible exception to the technical and economic impediments to additional major diversions. There were expressions of anxiety in public hearings about this possibility, which would, of course, lower Lakes Michigan–Huron and the downstream system, impair navigation, and reduce hydroelectric power generation in the Niagara and St. Lawrence Rivers. In fact, during a period of high water in the Great Lakes in the mid-1980s, a Commission study team evaluated the possibility of increasing the Chicago Diversion to reduce water levels. Shortly thereafter, there were calls, during a period of low water in the Mississippi River Basin, to increase the diversion for a limited period to ease navigation difficulties on the Mississippi River. In the 1980s, further diversions from the Great Lakes were reviewed, including the possibility of increasing the Chicago Diversion to replace water diverted from the Arkansas River Basin to help replenish the Ogallala aquifer[23]. In all cases, it was determined that such diversions would either not achieve the intended objectives or were too expensive to be practical. Any effort to increase the diversion in periods of either high or low water would have to overcome potential opposition from some downstream Mississippi Basin states and from Canada, the reluctance of any Great Lakes states to allow any increase in the diversion lest it become permanent, and the need for U.S. Supreme Court approval.

The Chicago Diversion was designed for a flow of 10,000 cfs (283 cms). When the Boundary Waters Treaty was signed in 1909, the U.S. government had already limited the Chicago Diversion to 4,167 cfs (118 cms)[24]. Subsequent urban development limits the diversion to 8,700 cfs (246 cms); flows above this level will damage property along the diversion.

In the short run, pressures for small removals via diversion or pipeline are most likely to come from growing communities in the United States just outside the Great Lakes Basin divide where there are shortages of water and available water is of poor quality. The cost of building the structures needed to support such diversions would be relatively small by comparison to the cost of building structures to move water vast distances. Population distribution[25] suggests that several communities that straddle or are near the Great Lakes Basin divide, particularly communities in Ohio, Indiana, and Wisconsin, may look to the Great Lakes for a secure source of municipal and industrial water supplies in the future. Such diversions would require the approval of the Great Lakes governors under the Water Resources Development Act of 1986 (WRDA), and they would fall within the provisions of the Great Lakes Charter. The only diversions approved in the United States under WRDA procedures to date have resulted in no net loss of water to the Great Lakes Basin. In Ontario, because of geography, there are currently no such pressures along the border of the Basin to draw on Great Lakes water, nor are there likely to be any in the future.

At a lesser level, water may be transferred in bulk by trucks or marine tankers. Because water is heavy, it is expensive to move. The geography of the region and the inability of the St. Lawrence Seaway to handle large tankers are such that the commercial viability of long-distance trade in bulk water from the

Great Lakes appears uneconomical. Moreover, other countries with abundant water supplies are located much closer to prospective foreign markets than are the Great Lakes. Even the California–Mexico border region could be served more effectively from the Pacific Northwest, Alaska, and Panama than from diversions or ocean tankers drawing water from the Great Lakes, and there are more readily accessible sources of water on the East Coast of North America.

Towing large fabric bags filled with water is a variation on freshwater export by ocean tanker. This technique has been used since late 1997 to provide water from the mainland to some of the Greek islands and to the Turkish part of Cyprus[26]. Apparently, these short-haul arrangements in the Mediterranean have reduced the cost of delivery to under $1 U.S. per cubic meter, but the limited capacity of the Great Lakes–St. Lawrence system and longer ocean distances may rule out the use of this technology in the Great Lakes Basin.

The difficulty and the expense of moving water in bulk are forcing water managers around the world to place greater emphasis on the efficient use of existing local sources. Treated domestic and industrial wastewaters are being used for many purposes, including lawn watering and agricultural irrigation. As demand for urban water supplies increases, communities are seeking to manage their demands rather than increase their supplies. In some areas, implementation of conservation techniques has reduced demand by as much as 50 percent. In other areas, water rights markets have shifted available water from agricultural to urban uses.

Desalination is another promising alternative to long-distance diversion (or shipment) of water. Santa Barbara chose during the California drought a decade ago to build a desalination plant in order to guarantee a reliable supply of water in preference to importing water by tanker and/or reducing system-wide use. More recently, Quebec has concluded that in most instances, the cost of desalination would be about half that of transporting freshwater long distances by ship. By late 2002, Tampa, Florida, will begin blending desalinated water with freshwater at costs that are competitive with the costs of developing new freshwater sources. Desalination technology is improving rapidly. Hybrid desalination systems, which combine thermal and membrane filtration, are lowering costs significantly, and throughout the world, new desalination projects worth billions of dollars are scheduled to come on-line over the next two decades[27].

Privatization. It is evident from the Commission's public hearings that many people are concerned about the growing trend toward private sector involvement in water utilities worldwide. Privatization incorporates a spectrum of private–public relationships such as entirely private, private with public oversight, and private management contracts. Governments are divesting themselves of their investments and services in order to promote capital inflow, efficiency, and solvency[28]. For example, Milwaukee, Toronto, Hamilton–Wentworth, and other cities in the Great Lakes Basin are involving the private sector in water or wastewater systems. Private sector involvement may lead to efficiencies, improved technology, improved customer service, and reduced cost[29]. In addition, other benefits include conservation, improved

Bottled Water Production in the United States: How Much Groundwater Is Actually Being Used?

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Bottled Water Production in the United States: How Much Groundwater Is Actually Being Used?

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Executive Summary

Bottled water is one of the fastest growing segments of the beverage industry in the United States, with recent annual growth rates of approximately 10%. Bottled water, comprised of water obtained from diverse sources (e.g., withdrawn from springs, pumped from groundwater, and purified from municipal sources) and delivered to market in a variety of product and container types, is now a "mainstream" beverage with literally hundreds of different brands in the U.S. alone. A quantitative survey of bottled water manufacturers in the U.S. was used to estimate annual (2001) U.S. (contiguous 48 states) bottled water production at regional and national scales. Data from 149 discrete water sources—scaled using data on the U.S. market for domestic bottled water—showed, not surprisingly, that bottled water production varies as a complex function of both population (i.e., demand) and water availability (i.e., supply). The highest rates of bottled water production were shown to occur in the relatively populous and water rich regions along the Atlantic, Pacific and Gulf of Mexico coasts, while the lowest rates of production were generally found throughout most of the mid-western and interior western U.S.

Relative to other uses of groundwater (from which most bottled water is obtained), bottled water production was found to be an insignificant quantity at regional and national scales. Total annual bottled water production in 2001 (5.34 billion gallons) was found to be a trivial component (0.019%) of total fresh groundwater withdrawals of about 27,600 billion gallons in 1995, the latest year for which complete published data from the U.S. Geological Survey (USGS) are publicly available. The estimate of the proportion of fresh groundwater withdrawals used in U.S. bottled water production is actually an *overestimate* for two reasons. According to an on-line version of the USGS report on U.S. water use for 2000, total fresh groundwater withdrawals increased by about 9% from 1995 to 2000, thus reducing the proportion of bottled water production to a value less than 0.018%. Secondly, my survey results indicated that about 9% of bottled water production is actually derived from municipal supplies, a

major portion of which is likely derived from surface water. It should be noted that groundwater use in the U.S. is dominated by agriculture, with more than 2/3 of the total withdrawn for crop irrigation and livestock uses. In fact, U.S. bottled water production is not even significant when compared to withdrawals of groundwater by public supplies—the second largest use of groundwater (19.7%). A better comparison of total U.S. bottled water production would be with *a* small U.S. public water system for a municipality with a population of about 100,000 residents. Annual water production by the following municipalities *each* exceeded total U.S. bottled water production in 2001: Pawtucket, Rhode Island; Huntington, West Virginia; Lafayette, Louisiana; and Ann Arbor, Michigan.

Bottled water production was also shown to be an infinitesimal percentage of renewable supplies at the national scale and in all but one water resource region (Lower Colorado). Finally, bottled water production was also shown to be a highly efficient manufacturing process: on average, 87% of water withdrawn was actually bottled in 2001 for the purpose of human consumption. From all of these results it was concluded that concerns about appropriate management of renewable groundwater resources would be best served by focusing on more significant—and far less efficient—users of water, most notably agriculture and municipalities that comprise 65% and 20% of total groundwater withdrawals on a national basis, respectively.

Introduction

Bottled water is one of the fastest growing segments of the beverage industry in the United States, with recent annual growth rates of approximately 10%. Bottled water, comprised of water obtained from diverse sources (e.g., withdrawn from springs, pumped from groundwater, and purified from municipal sources) and delivered to market in a variety of product and container types, is now a "mainstream" beverage with literally hundreds of different brands in the U.S. alone. While "tap water" still accounts for the majority of human consumption of drinking water in the U.S., bottled water in 2000 likely comprised 20-35% of the total amount of drinking water consumed. In fact, in 2000, the U.S. bottled water market surpassed the 5 billion gallon (BG) mark for the first time ever, including 4.5 BG obtained from U.S. water sources (BMCNY, 2001).

While the recent domestic U.S. "market" for bottled water has been very well detailed (BMCNY, 2001), data on the various sources of water, the locations of these sources, the amounts of groundwater abstracted from various regions of the U.S., the amounts of production relative to other water uses, and the amounts of production relative to renewable water supplies are not readily available from the scientific literature. Recently-published books, such as *Water Follies* by Robert Glennon (2002), leave the reader with the impression that the bottled water industry is a major purveyor of water in the United States and bears a significant responsibility for the depletion of groundwater resources throughout the U.S. Therefore, the Drinking Water Research Foundation (DWRF) initiated a scientific study in the spring of 2002 with a goal of obtaining this type of information and providing an interpretation of the data that would be helpful in explaining the position of the bottled water industry on water resources issues.

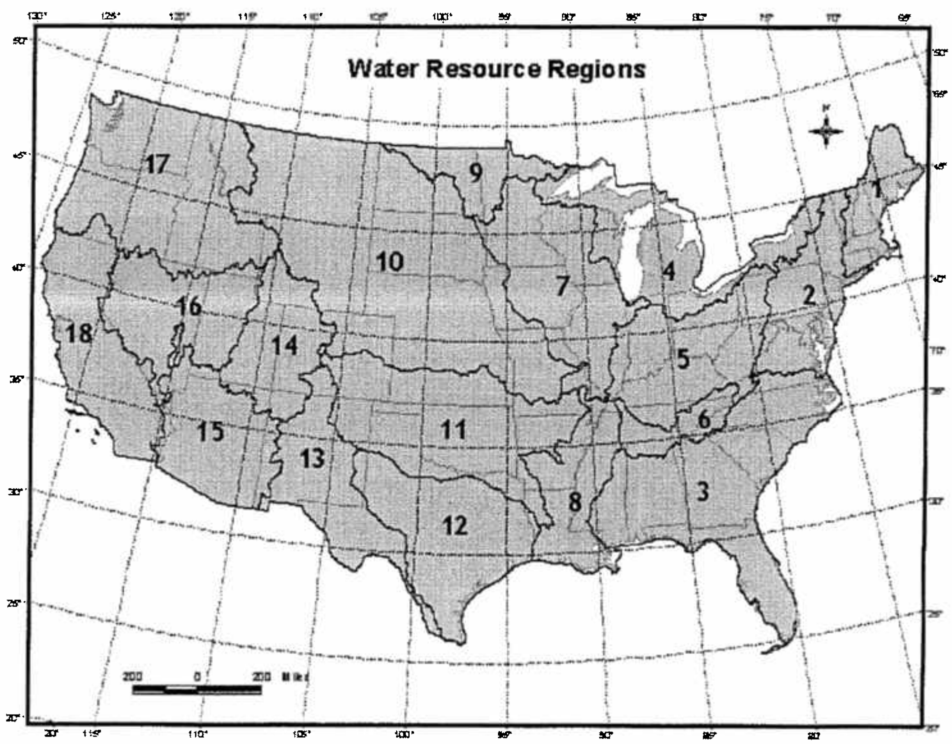
Methods

Several possible methods of obtaining the necessary information on annual U.S. bottled water withdrawals/production were considered at the beginning of the project. I was able to obtain an estimate of the 2000 U.S. bottled water market from a report issued by the Beverage Marketing Corporation of New York (BMCNY, 2001). This report indicates that the U.S. market for domestically-produced bottled water was about 4.9 BG in 2000, a 9% increase from the 4.5 BG market in 1999. Unfortunately, the BMCNY report does not contain information on bottled water *production* at either the state or regional scale. For the purposes of this study, I accepted the estimates contained in the BMCNY report as the best available measure of total annual U.S. bottled water production in years 1999 and 2000.

Another possibility for obtaining state or regional information on bottled water withdrawals was by contacting state regulatory agencies. Unfortunately, after consultation with DWRF staff who are quite knowledgeable of state regulations, this approach was abandoned because regulations regarding reporting of groundwater withdrawals vary dramatically from state to state. Some states (e.g., New Hampshire) keep highly detailed records of groundwater and surface water withdrawals, while many other states (e.g., West Virginia) have amassed virtually no data of this sort. Use of such data would have the effect of biasing the survey results in the direction of those states with the most rigorous reporting requirements. A second possible method of obtaining the data was through information summarized by the U.S. Census Bureau (USCB) in their regular economic census of manufacturing activities. These censuses are completed every five years, but the reports typically lag the data collection by about two years. The most recent census, the *1997 Economic Census for Bottled Water Manufacturing*, contains detailed data on the quantities of water bottled in 1992 and 1997 from U.S. companies with shipments in excess of $100,000 (USCB, 1999). The USCB report indicated that there were 102 companies with total bottled water shipments in 1997 of 486.9 million gallons (MG). Unfortunately, because of a conversion in the classification of bottled water manufacturing establishments by the USCB, the 1997 economic census apparently "does not include establishments primarily engaged in the bottling of mineral or spring water" (USCB, 1999), suggesting that the reported data significantly underestimated total production. Comparison of this estimate with the BMCNY estimate indicates that the USCB underestimated production by about one order of magnitude. The USCB report indicated, however, that the new classifications of bottled water manufacturing establishments would be fully implemented with the 2002 Economic Census (report likely available in late 2004).

The third approach for estimating annual U.S. bottled water production at the state or regional levels was by performing a comprehensive survey of bottled water manufacturers (approximately 300) that are members of the International Bottled Water Association (IBWA). Since bottled water manufacturers maintain data on water usage at the plant or source level, it was decided that this was probably the most promising approach for the present study. A survey of IBWA bottling companies was designed that involved sending a data form and data entry instructions to companies with a request to complete the form for each distinct water source for each recent year (2000, 2001) for which complete data were available. The form requested specification of the name and address of the bottling company, the person within the company responsible for providing the data, the approximate location (geographical coordinates, zip code, nearest city or town, and state) of each water source, and a brief descriptor (e.g., well, spring, municipal source, etc.) and name of each source (see sample data form included as Appendix A). The primary data request was for the total volume of water (gallons) from each source that was actually bottled during the calendar year, as well as the total volume of water that was withdrawn, but not actually bottled, from each source during the year. Each company was assured that the data would be considered confidential and that publication of the survey results would not specify the data sources.

Data obtained from the bottling companies were entered into a spreadsheet database and were used to estimate the total volume of water withdrawn and bottled for each year for the U.S. as a whole. A geographic data layer of the boundaries between different water resource regions (WRR's) was obtained from the U.S. Geological Survey (USGS) water use website (http://water.usgs.gov; Figure 1). In addition, the entire USGS database on 1995 U.S. water use (http://water.usgs.gov/public/watuse) was downloaded from the web. It should be emphasized that the 1995 data are the most recent data that can be used to directly estimate regional water use in the U.S. More recent water use data for 2000 described by Hutson *et al.* (2004), but not yet released to the public, cannot be used on a regional basis, but can be used at the national scale. The 1995 water use



data and the bottled water data were aggregated by WRR using Arcview. After aggregation by

Figure 1. Water resource regions (WRR's) of the contiguous U.S. states. Figure redrawn from Solley *et al.* (1998).

WRR, the computed water use values were checked against tabulated values reported both by

Solley *et al.* (1998) and by Brown (1999). Finally, USGS data on renewable water supplies (by WRR) were obtained from the USGS website (http://water.usgs.gov) and appended to the database. A tabular summary of the data is provided in Appendix B.

Results

Data completeness. Bottled water data were received for years 2000, 2001, and/or 2002 from a total of 34 companies (about 11% of the companies contacted). In general, data from 2002 were for a partial year, so no further analysis of year 2002 data was attempted. Since quite a few companies that submitted 2001 data did not submit data for 2000, however, it was decided that the interpretation would focus on the 2001 calendar year only. While only 28 (about 9%) of the companies submitted data for 2001, the resultant database included information on 149 distinct bottled water sources. Moreover, aggregation of the data from these 149 sources indicated that the database was able to account for 2.32 BG of bottled water production (Table 1)—nearly 44% of the total domestic bottled water production for 2001 based on the BMCNY market survey (*assuming* a 9% increase in production from 2000 to 2001—the same as the increase from 1999 to 2000). Given the very large proportion of bottled water production accounted for by the survey, the study results are believed to be representative of U.S. bottled water production in general. Since 9% of the companies surveyed were able to account for nearly 44% of the total bottled water production, it is apparent that many of the largest bottled water companies submitted source data, while the overwhelming majority of small bottling companies did not.

Bottled water production by source. Spring water comprised by far the largest portion (74%) of U.S. bottled water production in 2001, with groundwater from wells a distant second (17%); municipal water represented 9% of total production (Table 1). In contrast, "unbottled" (i.e., water used

Table 1. U.S. (48 states) bottled water production by source descriptor (raw data for 2001).

Source descriptor	No. of sources	Gallons bottled (thousands)	Percentage of total	Gallons not bottled (thousands)	Percentage of total
Spring	92	1,716,283	74.0	80,238	22.7
Well	22	391,335	16.9	139,858	39.6
Municipal	35	211,647	9.1	133,107	37.7
Total	149	2,319,265	100.0	353,204	100.0

in the bottling process, but not actually bottled) water use was dominated by well and municipal sources, each comprising slightly less than 40% of the total water used; spring water was a distant third (23%) in unbottled use (Table 1).

Efficiency of bottled water production. The raw data from the survey clearly indicate that U.S. bottled water production is highly efficient. Bottling companies that reported data used a total of 2.67 BG in 2001. Of this total, 2.32 BG (87% of the total water used) were actually bottled (Table 1), with the remaining 13% discharged to wastewater. These data suggest that spring water is most efficiently (96%) used, while municipal water is least efficiently (61%) used. At least part of the explanation for this is that many companies that primarily bottle spring water use municipal water (or in some cases well water) for other purposes in the manufacturing process.

Withdrawals from individual sources. The raw source data shown in Table 1 suggest that annual withdrawals for bottled water production (and other uses) from individual sources are on average very modest. The mean annual withdrawals of spring water, groundwater from wells, and municipal water from individual sources in 2001 were 53,500, 66,150, and 27,000 gallons per day

(GPD), respectively. For all sources, the mean withdrawal rate was about 49,100 GPD. The median withdrawal rate computed from the raw data (19,100 GPD) was found to be much lower that the mean rate, indicating that the frequency distribution of sources is highly skewed toward smaller sources. It is interesting that the median and mean withdrawal rates are both less than 50,000 GPD—a rate that is actually considered too small to permit in many states. The maximum annual withdrawal of water from an individual source was 645,000 GPD, and only one other source in the database had a withdrawal in 2001 that exceeded 250,000 GPD.

Regional distribution of bottled water production. Since the bottled water market in 2001 was greater than the total volume of water directly accounted for by the survey, it was necessary to scale the regional raw survey data (Figure 2) to estimate bottled water *production* in 2001 for each of the 18 WRR's. The same scaling factor was used for each WRR: the ratio of total U.S. bottled water production in 2001 to the total U.S. bottled water production computed for this survey (5.34 BG/2.32 BG = 2.30). Bottled water production was generally highest in regions bordering the Atlantic, Pacific, and Gulf of Mexico coasts (Figure 3). Figure 3 indicates that roughly 1/4 of U.S. bottled water production occurs in each of three regions—New England (WRR 1), Mid-Atlantic (WRR 2), and California (WRR 18)—with the remaining 25% of production distributed throughout the other 15 regions. Higher rates of bottled water production in these three regions are not entirely explained by differences in population, however. In particular, per capita rates of bottled water production in 2001 (gallons per capita, GPC) were highest in New England (95.4 GPC = 0.26 GPC per day) and California (40.7 GPC = 0.11 GPC per day), probably reflecting higher rates of consumption in these regions (Figure 4). The higher rate of per capita production in New England may also reflect higher consumption of bottled water in the neighboring Mid-Atlantic region as well: the weighted mean bottled water production in the New England and Mid-Atlantic regions

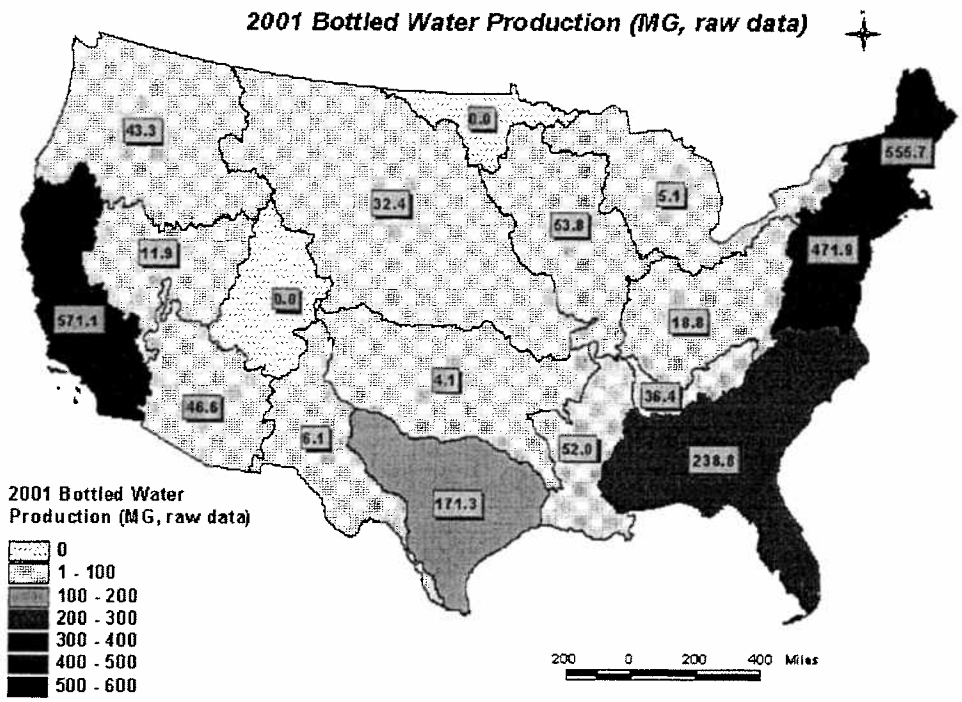


Figure 2. Aggregated bottled water production (in MG) for 2001 by WRR directly accounted for by the survey.

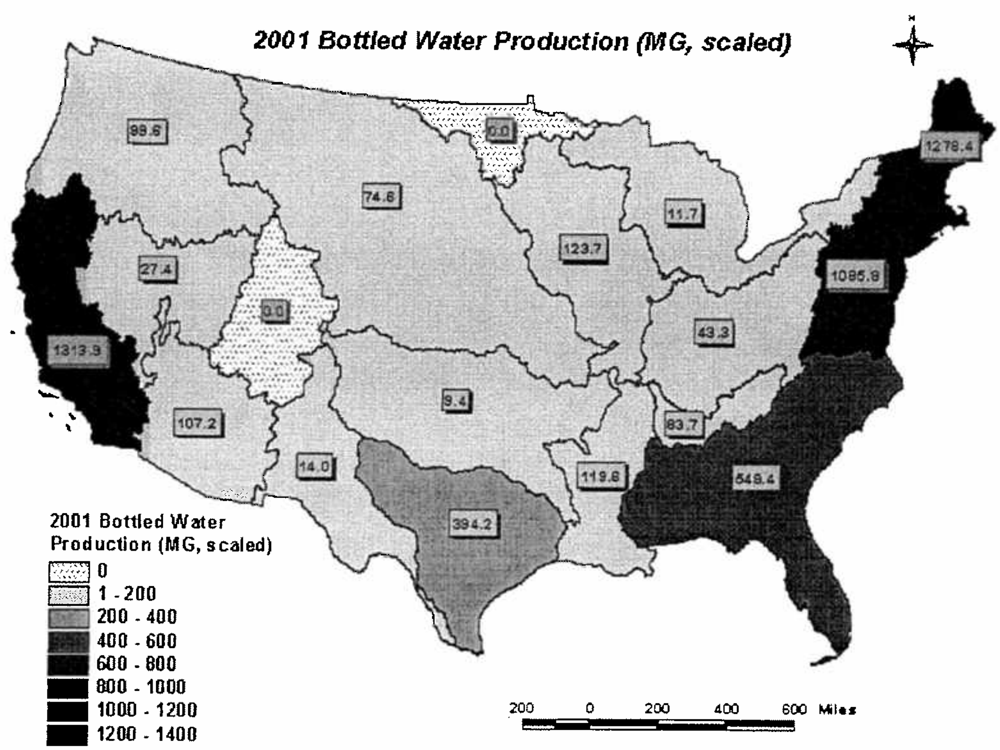


Figure 3. Aggregated and scaled bottled water production (in MG) for 2001 by WRR.

was estimated as 42.4 GPC (0.12 GPC per day), nearly identical to the value estimated for California (Figure 4). The survey results provided an estimate of zero bottled water production in two WRR's—Upper Colorado (WRR 14) and Souris-Red-Rainy (WRR 9). Similar results were also found for the geographic distribution of total water usage by the bottled water industry for 2001 (Figures 5 and 6).

Bottled water production as a function of total fresh groundwater withdrawals.

Total annual bottled water production in 2001 (5.34 BG) was found to be a trivial component (0.019%) of total fresh groundwater withdrawals of about 27,600 BG in 1995, the latest year for which complete published data from USGS are publicly available (Solley *et al.*, 1998). This estimate of the proportion of fresh groundwater withdrawals used in U.S. bottled water production is actually an *overestimate* for two reasons. According to an on-line version of the USGS report on U.S. water use for 2000 (Hutson *et al.*, 2004), total fresh groundwater withdrawals increased by about 9% from 1995 to 2000, thus reducing the proportion to a value closer to 0.0065%. Secondly, this survey indicated that about 9% of bottled water production is actually derived from "municipal" supplies, a major portion of which is surface water. It should also be noted that fresh groundwater use in the U.S. is dominated by agricultural uses, with nearly 70% used for crop irrigation and livestock. In fact, it turns out that U.S. bottled water production is not even significant when compared to withdrawals of groundwater for public supplies—the second largest use of groundwater (19.7%, Solley *et al.*, 1998). A better comparison of total U.S. bottled water production would be with *a* small U.S. public water system for a municipality with a population of about 100,000 residents. For example, data in the *The Water Encyclopedia* (2nd Edition, van der Leeden *et al.*, 1990) indicates that annual water production by the following municipalities *each* exceeded total 2001 U.S. bottled

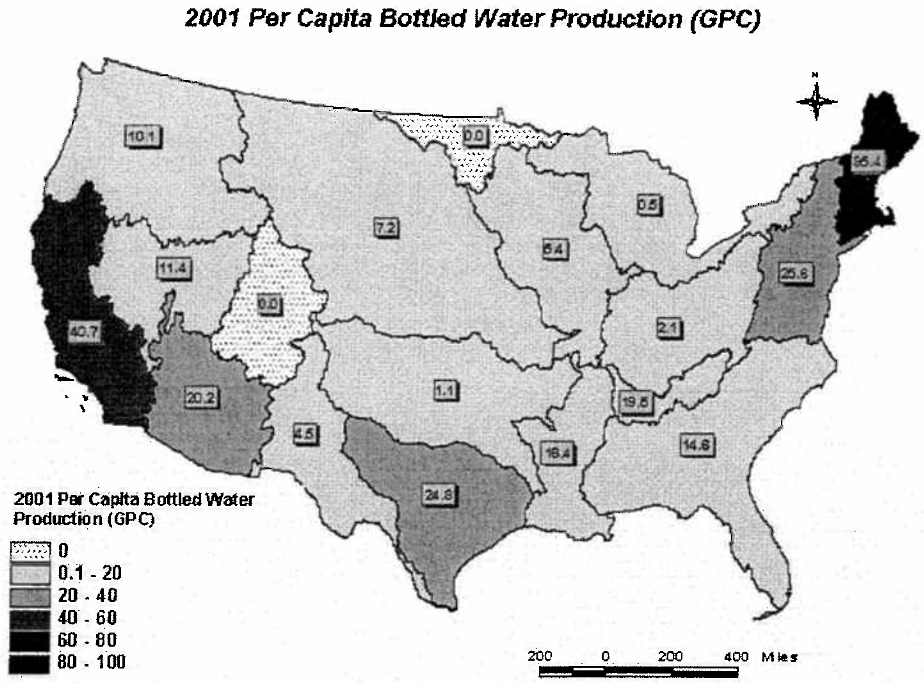


Figure 4. Per capita bottled water production (in GPC) in 2001 by WRR.

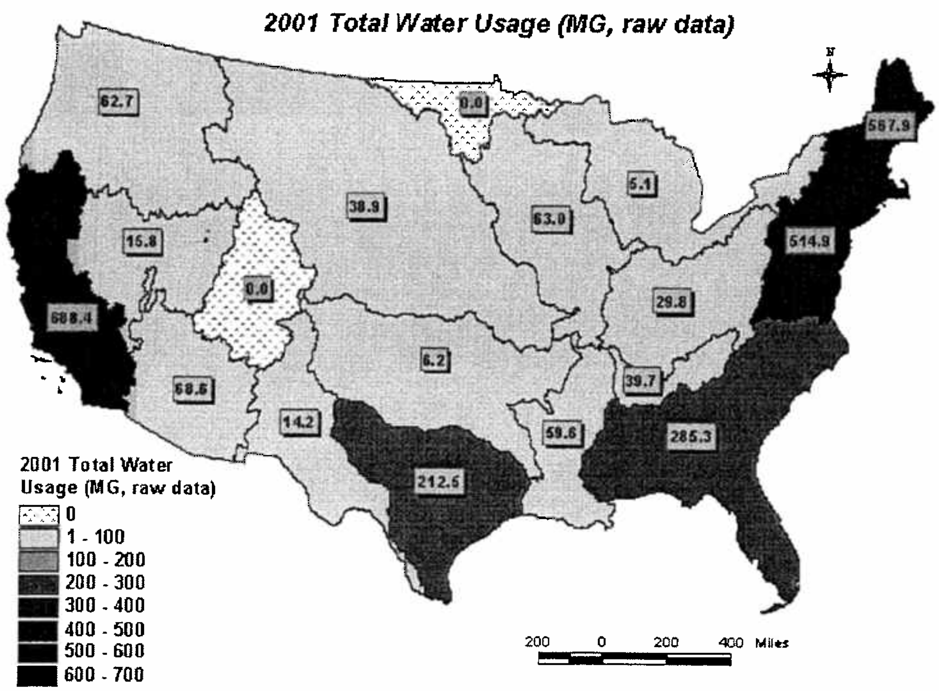


Figure 5. Aggregated total water usage (in MG) in 2001 by WRR directly accounted for by the bottled water survey.

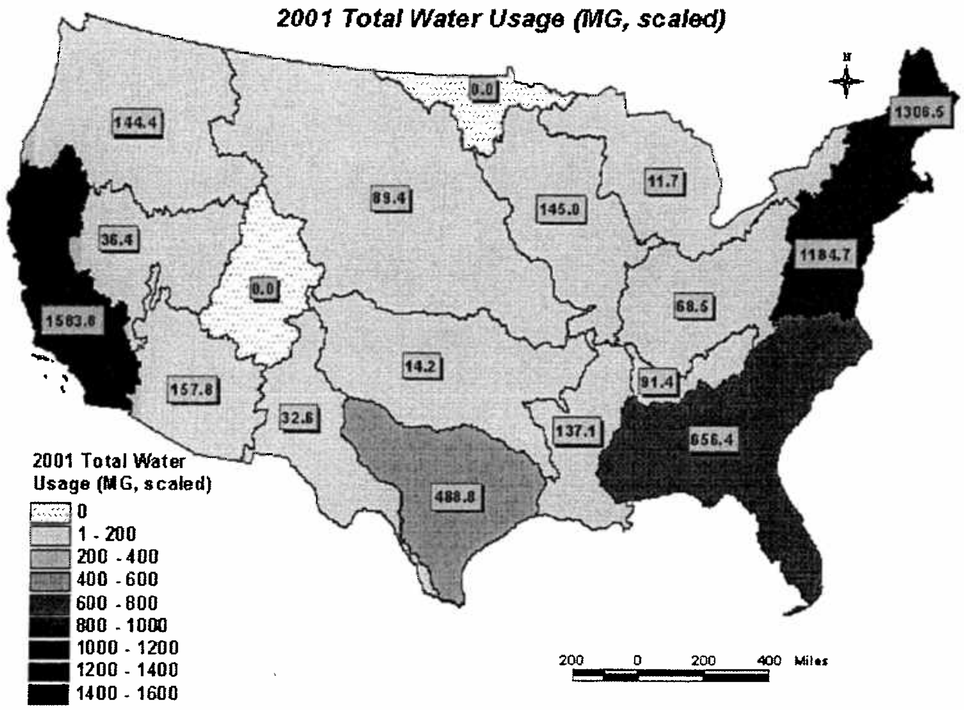


Figure 6. Aggregated and scaled total water usage (in MG) for 2001 by WRR.

water production: Pawtucket, Rhode Island; Huntington, West Virginia; Lafayette, Louisiana; and Ann Arbor, Michigan.

At the regional scale, bottled water withdrawals exceeding 0.03% of total fresh groundwater withdrawals were found only in the New England (0.483%) and Mid-Atlantic (0.110%) WRR's (Figure 7). These higher percentages on a relative basis are largely reflective of the relatively low rates of annual groundwater withdrawals in these regions (Figure 8). Total annual fresh groundwater withdrawals in both the New England and Mid-Atlantic WRR's in 1995 (265 and 984 BG, respectively) were particularly low—comprising just 1.0% and 3.6% of total fresh groundwater withdrawals from the 18 WRR's, respectively.

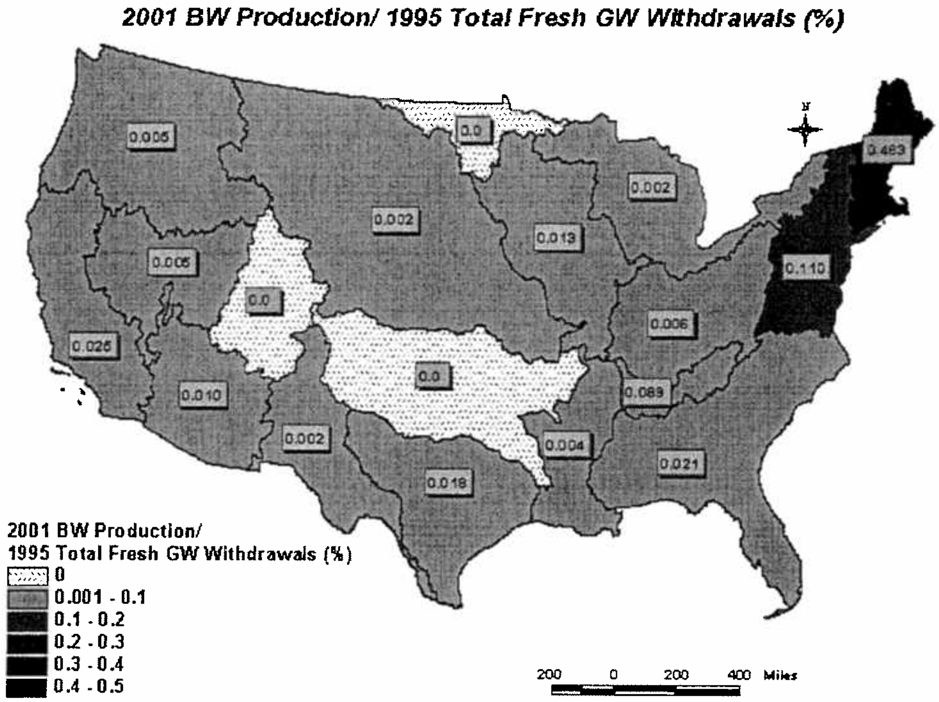


Figure 7. Aggregated and scaled bottled water production in 2001 as a percentage of total fresh groundwater withdrawals.

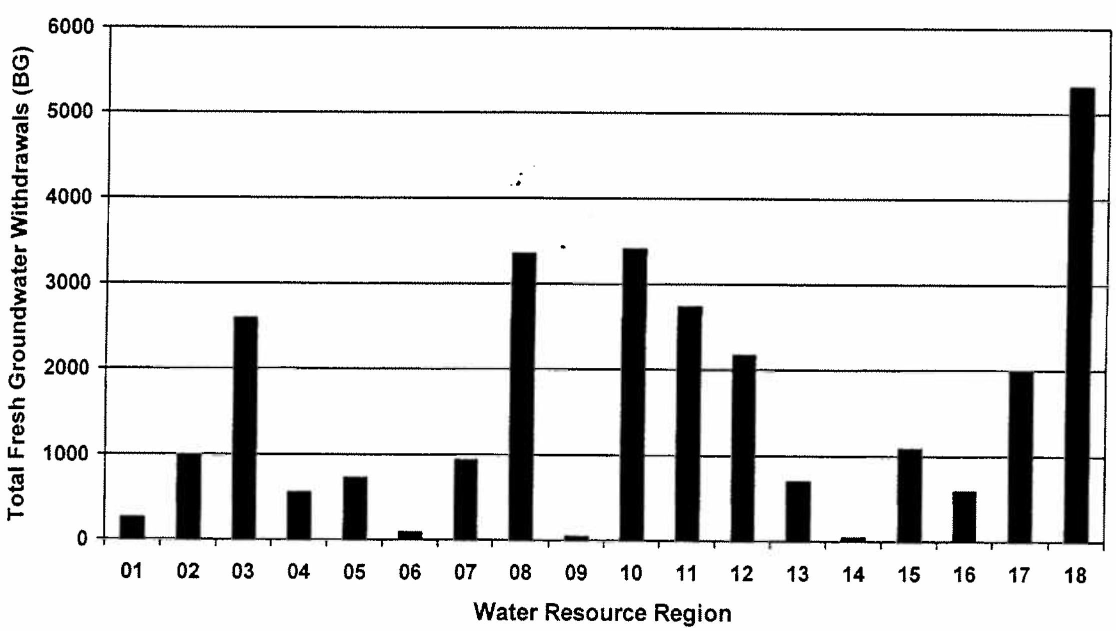


Figure 8. Total fresh groundwater withdrawals in 1995 by WRR (data from Solley *et al.*, 1998).

Bottled water production as a function of renewable water supply. Groundwater supplies are continuously "recharged" or replenished by precipitation (i.e., groundwater resources are thus considered "renewable"). Data on regional renewable water supplies obtained from USGS (based on 1995 water use data) suggest dramatic geographic differences in annual net recharge by precipitation (Figure 9). The value for the Lower Colorado (WRR 15) was corrected by subtracting upstream input from the Upper Colorado (WRR 14), while the value for the Lower Mississippi (WRR 8) was corrected by subtracting inputs from five upstream WRR's (WRR's 5, 6, 7, 10, and 11). With the exception of WRR 15, all WRR's showed positive renewable supplies; the negative renewable supply for WRR 15 can only be sustained over the long-term by upstream inputs of river runoff from WRR 14. At the national scale, the 1995 renewable supply was computed as 1270.4 billion gallons *per day* (BGD), with 2/3 of this total comprised of supplies found in six WRR's located along the Atlantic, Pacific, and Gulf of Mexico coastlines (Figure 9). At the national scale, 2001 bottled water production of 5.34 BG (*per year*) is clearly trivial in comparison to renewable supply of 1240.4 BGD. Annual bottled water production was an infinitesimal 0.0012% of renewable supply. If renewable supply can be represented as a typical backyard swimming pool (capacity of 20,000 gallons), annual bottled water production in 2001 was equivalent to almost exactly one quart bottle! At the regional scale, only five WRR's had total bottled water production that exceeded 0.001% of the renewable supply, including WRR 15 where renewable supply is actually negative (Figure 10).

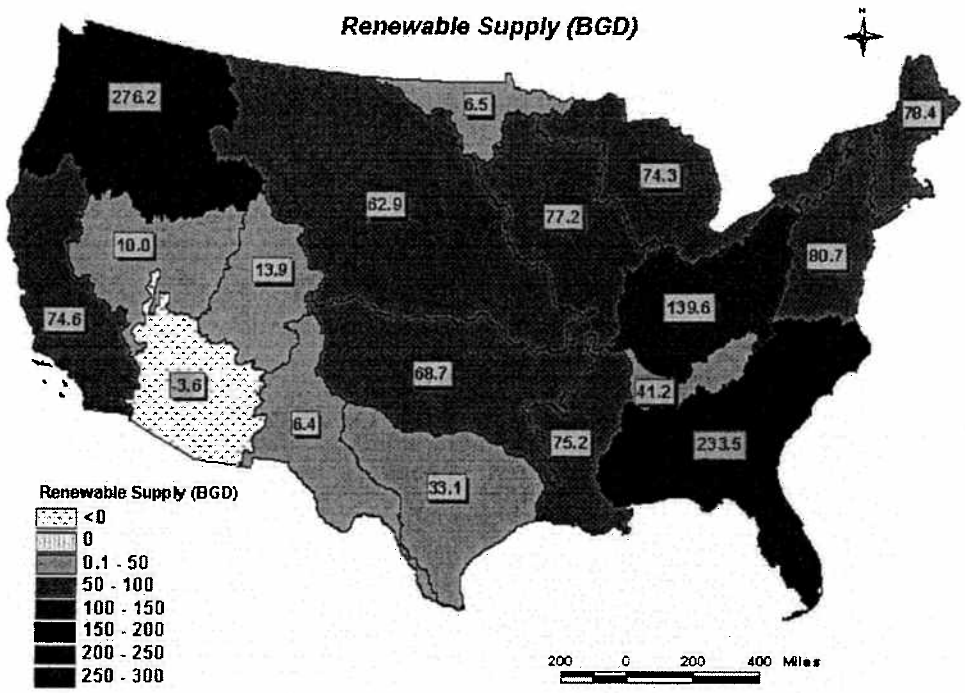


Figure 9. Renewable water supplies (in BGD) by WRR.

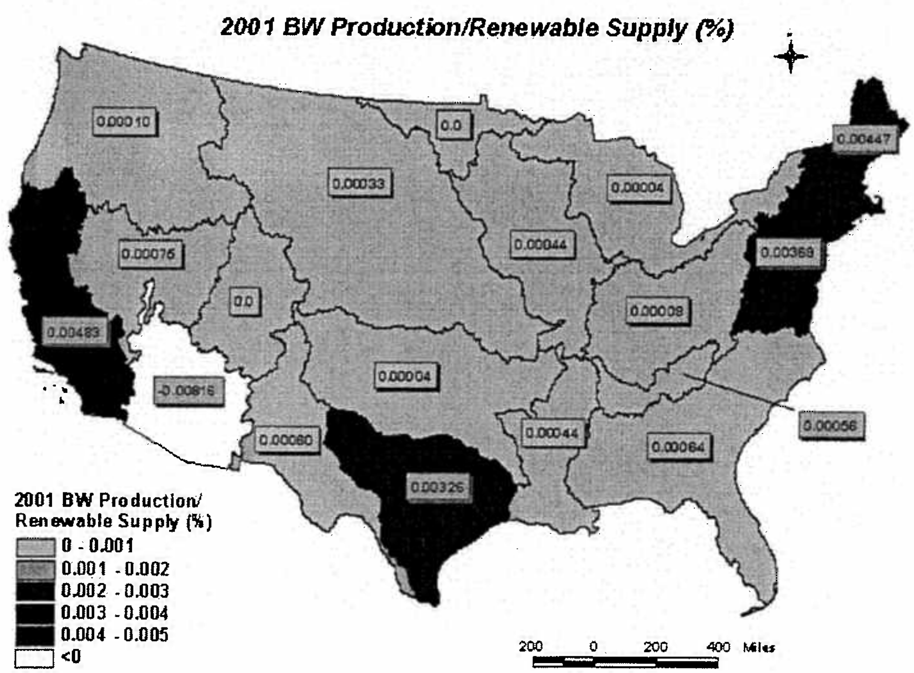


Figure 10. Annual bottled water production in 2001 as a percentage of renewable supply.

Summary and Conclusions

Data from 149 discrete water sources—scaled using data on the U.S. market for domestic bottled water—showed, not surprisingly, that bottled water production varies as a complex function of both population (i.e., demand) and water availability (i.e., supply). The highest rates of bottled water production were shown to occur in the relatively populous and water rich regions along the Atlantic, Pacific, and Gulf of Mexico coasts, while the lowest rates were generally found throughout most of the mid-western and interior western U.S. Relative to other uses of groundwater (from which most bottled water is obtained), bottled water production was found to be an *insignificant* quantity at regional and national scales. In all but one water resource region (Lower Colorado) and at the national scale, bottled water production was also shown to be an *infinitesimal* percentage of renewable supplies. In contrast to a recent conclusion drawn by Glennon (2002) about the size of present bottled water withdrawals, this study further indicated that most bottled water sources are actually quite small. It is interesting that the median and mean withdrawal rates are both less than 50,000 GPD—a rate that is actually considered too small to permit in many states. Finally, bottled water production was shown to be a highly efficient manufacturing process: on average, 87% of water withdrawn was actually bottled in 2001 for the purpose of human consumption. From all these results, it is clear that concerns about appropriate management of renewable groundwater resources would be best served by focusing on more significant—and far less efficient—users of water, most notably agriculture and municipalities that comprise 67% and 20% of total groundwater withdrawals on a national basis, respectively.

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Appendix A. Sample data form used in the bottled water survey.
Current U.S. Bottled Water Production: Raw Data Table

1) Name of bottled water company:	**All Natural Bottling Company**
2) Address of bottled water company:	**999 Water Street** **Hydrotown, Pennsylvania 55555**
3) Name of technical representative:	**Quench Mithirst**
4) Position of technical representative:	**Plant Manager**
5) Phone number:	**555-555-5555**
6) Fax number:	**555-555-1111**
7) E-mail:	**Qmithirst@AllNaturalBottlingCo.com**
8) Calendar year for data provided: (*2001 or 2002*)	**2001**
9) Source name:	**Spring X**
10) Source location[a]:	**Hydrotown, PA 55555**
11) Source descriptor[b]:	**spring**
12) Total source volume (gallons) bottled in calendar year:	**5,555,500**
13) Total source volume (gallons) used but not bottled in calendar year[c]:	**1,111,100**
14) Total source volume (gallons) used in calendar year (sum of 12 and 13):	**6,666,600**

[a]nearest city or town, state, and zipcode to withdrawal (***not*** plant) location (or latitude and longitude, if known)

[b]spring, groundwater well, municipal supply, etc.

[c]used in plant operations such as washing, rinsing, etc.

Please complete a separate form for each source for each year and return completed form to: Keith N. Eshleman, Appalachian Laboratory, UMCES, 301 Braddock Road, Frostburg, MD 21532; ph.: 301-689-7170; fax: 301-689-7200; e-mail: eshleman@al.umces.edu.

Appendix B. Tabular summary of data obtained and used in the bottled water study. See text for discussion of scaling methodology.

Water Resource Region	2001 Bottled Water Production (raw data, gallons)	2001 Water Not Bottled (raw data, gallons)	2001 Total Water Usage (raw data, gallons)	2001 Bottled Water Production (scaled, gallons)	2001 Water Not Bottled (scaled, gallons)	2001 Total Water Usage (scaled, gallons)	1995 Population (millions)	2001 Per Capita Bottled Water Production (scaled, gallons)	1995 Total Fresh Groundwater Withdrawals (BGD)	2001 Bottled Water Production (scaled)/1995 Total Fresh Groundwater Withdrawals (%)	Renewable supply (BGD)	2001 Bottled Water Production (scaled)/Renewable Supply (%)	Bottling Efficiency (%)
01	555666367	12198445	567864812	1278437807	28065318	1306503125	13.4	95.4	0.725	0.483	78.4	0.00447	97.9
02	471934360	42973821	514908180	1085793138	98871123	1184664261	42.4	25.6	2.693	0.110	80.7	0.00369	91.7
03	238799121	46491598	285290720	549412098	106964575	656376673	37.6	14.6	7.109	0.021	233.5	0.00064	83.7
04	5086036	5000	5091036	11701591	11504	11713095	23.5	0.5	1.515	0.002	74.3	0.00004	99.9
05	18833417	10959728	29793145	43330591	25215366	68545957	21.1	2.1	1.977	0.006	139.6	0.00009	63.2
06	36400000	3320000	39720000	83746541	7638421	91384962	4.3	19.5	0.258	0.089	41.2	0.00056	91.6
07	53767000	9250000	63017000	123703304	21281745	144985049	22.8	5.4	2.570	0.013	77.2	0.00044	85.3
08	51970000	7600000	59570000	119568894	17485542	137054435	7.3	16.4	9.183	0.004	75.2	0.00044	87.2
09	0	0	0	0	0	0	0.7	0.0	0.115	0.000	6.5	0.00000	-
10	32436000	6440000	38876000	74626451	14816696	89443146	10.3	7.2	9.319	0.002	62.9	0.00033	83.4
11	4087965	2068760	6156725	9405300	4759656	14164957	8.7	1.1	7.495	0.000	68.7	0.00004	66.4
12	171319102	41132360	212451466	394158853	94634420	488793272	15.9	24.8	5.957	0.018	33.1	0.00326	80.6
13	6105283	8051765	14157048	14046603	18524930	32571533	3.1	4.5	1.928	0.002	6.4	0.00060	43.1
14	0	0	0	0	0	0	0.7	0.0	0.114	0.000	13.9	0.00000	-
15	46582597	22019500	68602097	107173939	50660905	157834844	5.3	20.2	2.986	0.010	-3.6	-0.00816	67.9
16	11909050	3912450	15821500	27399498	9001488	36400986	2.4	11.4	1.609	0.005	10.0	0.00075	75.3
17	43279548	19467307	62746854	99574518	44789001	144363518	9.9	10.1	5.500	0.005	276.2	0.00010	69.0
18	571088898	117312895	688401792	1313920874	269905197	1583826071	32.3	40.7	14.570	0.025	74.6	0.00483	83.0
Total	**2319264744**	**353203629**	**2672468375**	**5336000000**	**812625885**	**6148625885**	**248.3**	**21.5**	**75.623**	**0.019**	**1270.4**	**0.00115**	**86.8**

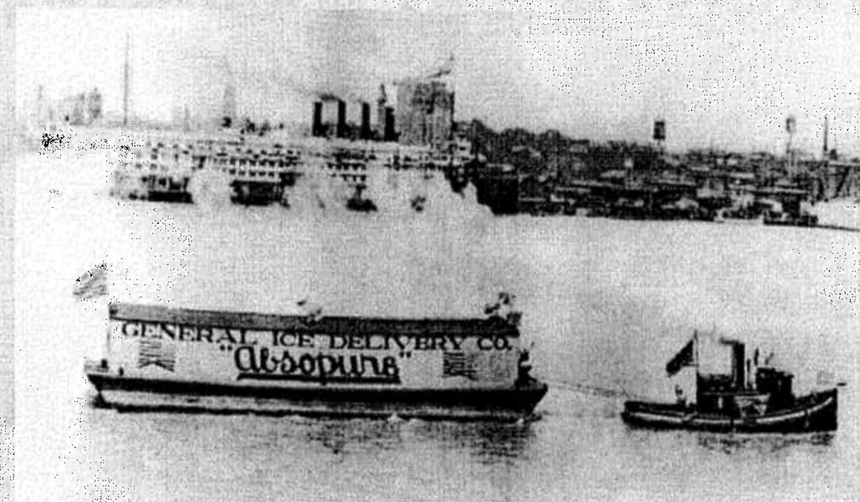
Absopure Water – Since 1908

Absopure Water Company and Affiliates House Committee Presentation

November 7th, 2007

Absopure Water and Affiliates

- Founded in Michigan, Absopure has been in business since 1908… celebrating it's 100 year anniversary in 2008!
- Same family ownership for over 50 years!
- Based in Michigan – employs over 5,000 people.



Absopure Water and Affiliates

AFFILIATE PROFILE

- Plastipak Packaging – Michigan-based plastic bottle manufacturing company employing 4,500 within USA
- Whiteline Express – Michigan-based trucking co. employing 400 people
- Clean Tech & TABB Packaging Solutions – Michigan-based plastic recycling companies with over 100 Michigan employees; state of the art facility in Dundee, MI

These companies contribute state employment of over 1,100 employees, creating a yearly $44 Million state payroll

These companies have also invested over $200 Million in capital spending, and we spend another $200 Million with Michigan-based vendors during the last 12 months

Absopure Water and Affiliates

Impact on Michigan Tax Base

Personal Property Taxes	$ 1,299,000
Real Property Taxes	868,100
Sales & Use Taxes	857,500
Single Business Taxes	737,900
Fuel Taxes and Registration Fees	223,900
Withholding Taxes	1,590,000
Impact on Michigan Tax Base	**$ 5,567,400**

Absopure Water and Affiliates

Impact on Michigan Economy

Annual Michigan Payroll	$ 44,080,300
Investment in Michigan Assets	$201,318,000
Annual Spend with Michigan Vendors	$203,466,000

Clean Tech

CLEAN TECH
INCORPORATED

A Michigan Commitment to Recycling

CLEAN TECH
INCORPORATED

Clean Tech
H.D.P.E. and P.E.T. Recycling

Recycle material from 20 states, including most plastic bottles from Michigan curbside programs… over 1.5B bottles a year

<u>P.E.T. (ie: Water & Soft Drink Bottles)</u>

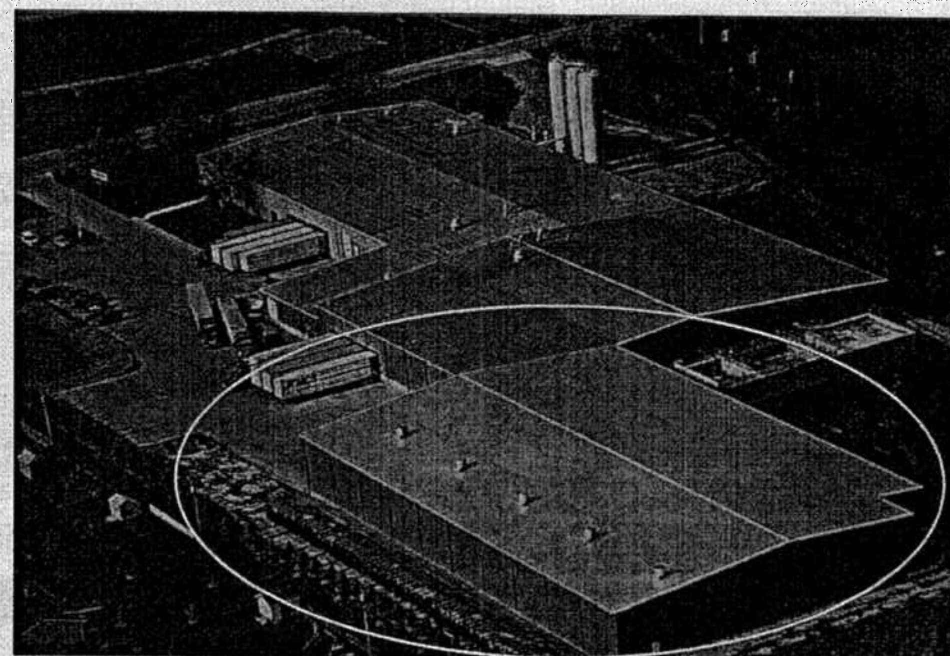
- 100MM lbs Capacity

<u>H.D.P.E. (ie: Laundry detergent)</u>

- Doubled size of Processing Capability
- Approximately 90MM Pounds Processing Capacity

CLEAN TECH
INCORPORATED

DUNDEE, MICHIGAN



Recent expansion

Clean Tech

Michigan's 2006 Water Use Legislation

- Governor Granholm signed legislation on February 28, 2006
- Enacted comprehensive & balanced water use legislation with tough regulation of large scale withdrawals
- Resulted from bipartisan negotiation with government, industry, and environmental interest group participation, including Absopure Water
- As part of the process, we agreed to <u>stricter</u> regulation for bottled water than for other groundwater use
- The bills under consideration threaten to unravel this legislation and set Michigan's water use protection laws back at a time when we can least afford it

Bottled Water is a Consumptive Use

- A major problem with the bills under consideration – elimination of the definition of bottled water as a "consumptive use"
  - consumptive use is self-evident: people don't bathe in it, irrigate with it, or manufacture with it
- Of the 11 billion GPD (Gallons Per Day) of large-scale water withdrawals in Michigan, bottled water is a very small percentage
- Additionally, bottled water is not feasible for large-scale long-distance shipments due to freight costs

Bottled Water is a Consumptive Use

- Nationwide, only 0.02% of groundwater withdrawals is used for bottled water
- Michigan and the Midwest as a whole are not centers for bottled water manufacturing – mostly produced on the East, West, and Gulf Coasts
- The Great Lakes Basin imports 14 times more bottled water than it exports
- Passing the legislation will not accomplish its stated purpose – it will only make Michigan uncompetitive to neighboring states
- Industrial water use is declining – From 800 MGD to 550 MGD or less (-33% less from 1997, -24% less from 2002)

Public Trust Doctrine

- The State has the obligation to regulate water, but does not own every single drop of water.

- If the State goes too far, it raises constitutional issues in respect to private property rights.

Environmental Stewardship and Corporate Responsibility

- Some proponents of this legislation are advocating based upon perceptions that plastic water bottles are an unnecessary extravagance.

- Actual water withdrawals for bottled water are a comparatively minor consumptive use.
  - Additionally, bottled water is not feasible for large-scale long-distance shipments due to freight costs

- Review of some of our significant **green** contributions to the State of Michigan:
  - Clean Tech and Tabb Packaging Solutions plastic recycling capabilities
  - Our companies' success in light-weighting plastic bottles
  - Promoting bottled water as a healthy alternative to other beverage choices

In Closing

FACT 1

- Passing this legislation does not represent the best of Michigan spirit, is not the product of compromise and bipartisan effort, and most certainly will not benefit generations to come.

FACT 2

- Absopure supports sensible management of Michigan's water resources – long term quality and sustainability is vitally important to our ongoing commercial success.

Thank You

Questions?